Feb. 8, 1966 C. A. CLEMENTS 3,233,789

LIQUID DISPENSING SYSTEM

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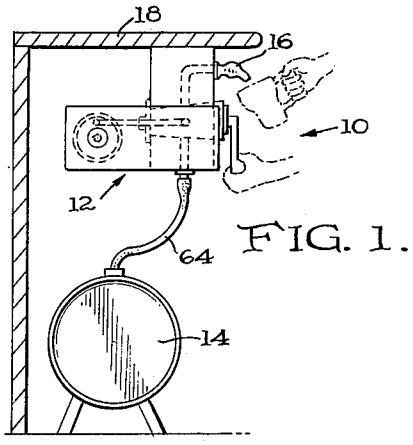



FIG. 1.

FIG. 2.

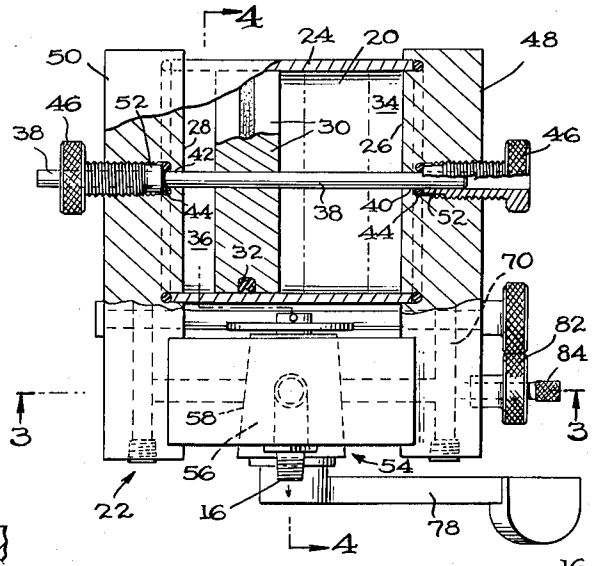



FIG. 3.

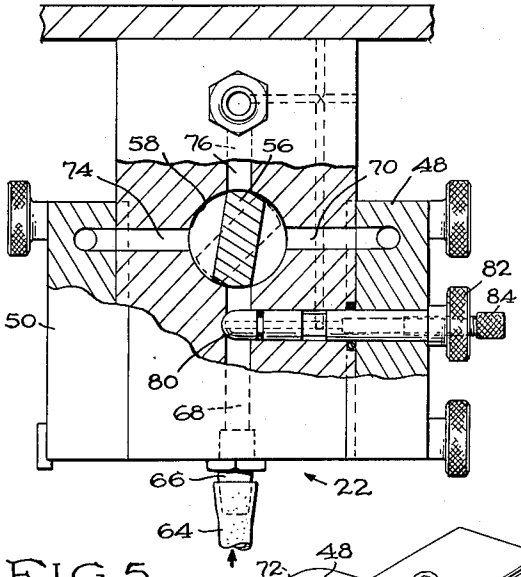



FIG. 4.

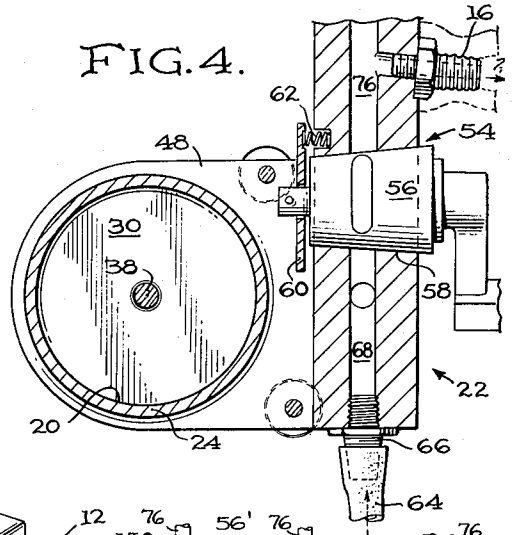
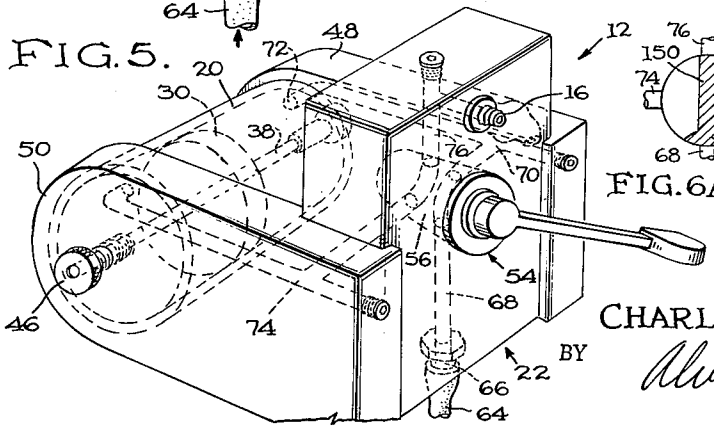



FIG. 5.



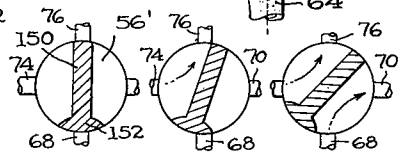




FIG. 6A. FIG. 6B. FIG. 6C.

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# LIQUID DISPENSING SYSTEM

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5 Claims. (Cl. 222—249)

The present invention relates to a liquid dispensing system, and more particularly to a novel method and apparatus for dispensing carbonated liquids without undue foaming of the liquid and without permitting the liquid to become contaminated.

It has long been desirable to dispense carbonated beverages, particularly beer, from a large supply such as a barrel without dispensing the beverage in a foamy state. Except for my previous Patent No. 2,998,164 issued August 29, 1961, the devices of the prior art for accomplishing the dispensing of pressurized and carbonated liquids properly chilled and without too much foam have not been entirely successful. Particularly where highly-gas-charged liquids are to be dispensed, the presence of excessive foaming and inherent waste present serious economic and functional dispensing problems, especially during "rush-hour" business periods, when a maximum speed of segregated pouring is essential. An average waste of ten percent is not unusual during such periods with old-style equipment.

Even the subject matter of Patent No. 2,998,164 has certain inconvenient features and the present invention is an improvement upon that device. The invention of such patent involves a cooler and dispenser of liquids utilizing two cylinders and a four-way valve mechanism wherein the valve mechanism controls flow of liquid into and out of portions of the two cylinders. The inconveniency of this two cylinder system lies in its relatively large dimensions, the long piping circuit, and the danger that liquid being dispensed from the system might be contaminated by deposits within the pipes such as could be produced when the cylinder walls are put in contact alternatively with beer and air.

It is therefore an object of the present invention to provide an improved cooling and dispensing system over that of Patent No. 2,998,164.

It is another object of the present invention to provide a method and apparatus for overcoming the deficiencies of the prior art, such as indicated above.

It is another object of the present invention to provide a method and apparatus for dispensing either carbonated or non-carbonated liquids and beverages which is simple and economical to build and yet which is simple and effective in its operation.

It is another object of the present invention to dispense beverages both relatively free of foam and free of any contamination.

It is another object of the present invention to provide a cooling and dispensing system for the dispensing of highly carbonated beverages such as continental European beers, without causing the evolution of too much foam.

It is a specific object of the present invention to provide a liquid dispensing apparatus comprising a single cylinder with a piston therein, the location of which is operated by a central control tap which can be activated to dispense liquid on both sides of the piston.

Other objects in the nature and advantages of the instant invention will be apparent from the following description of an exemplary embodiment of the invention

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taken in conjunction with the accompanying drawings, wherein:

FIG. 1 is a schematic diagram showing the system in operation;

FIG. 2 is a plan view of the device partly in section;

FIG. 3 is a section taken along line 3—3 of FIG. 2;

FIG. 4 is a section taken along line 4—4 of FIG. 2 with certain parts in elevation;

FIG. 5 is a perspective of the device; and

FIG. 6 is a series of schematic views taken along the same plane as FIG. 3 and showing another embodiment of one feature of the invention in operation.

The dispensing system of the present invention is shown generally at 10 in FIG. 1 and comprises a dispenser 12 which may be surrounded by cooling or refrigeration coils (not shown) or which may be cooled with other suitable means, a source of pressurized liquid to be dispensed, such as a beer barrel 14, and a dispenser nozzle 16. As shown in FIG. 1, the dispenser may be mounted beneath a bar or counter 18 with the liquid source 14 thereunder. Alternately, the source of liquid may be located at a remote distance from the dispenser 12, such as in a basement; or, if the source of liquid is a smaller container, such as a gallon jug, the dispenser 12 may be adapted to be mounted directly thereon for use in the home (the dispenser 12 could be either purchased for home use and used with each gallon of beverage purchased or it could be rented upon purchase of the beverage). As indicated in Patent No. 2,998,164, the source of liquid may be maintained under pressure by compressed carbon dioxide gas or other permissible gas which is passed from an auxiliary tank (not shown) into the upper part of the barrel 14 to apply surface pressure on the liquid therein. When the barrel 14 is empty, it may be replaced.

The dispenser 12, shown in detail in FIGS. 2–5 comprises a cylinder portion 20 and a portion 22 for passing the liquid from the barrel 14 to the cylinder 20 and then from the cylinder 20 to the nozzle 16.

The cylinder 20 has a single cylindrical sidewall 24 and two end walls 26 and 28. Located within the cylinder 20 and spanning its cross-sectional area is a single piston 30 which is adapted to move axially within the cylinder 20. The piston 30 is provided with a sealing ring 32 to prevent liquid flow from one side of the piston to the other side thereof. The piston 30 thus divides the cylinder 20 into two variable size chambers 34 and 36.

Passing through the center of the piston 30 is an axle 38 which in turn passes into opposite holes 40 and 42 in the end walls 26 and 28, respectively, of the cylinder 20. Although it is possible to rigidly fix the axle 38 with respect to the cylinder 20 and permit the piston 30 to slide upon the axle 38, it is preferable to rigidly fix the piston 30 to the axle 38 and cause them to move together as a single unit by having the axle 38 slidably engage with the holes 40 and 42.

In the preferred embodiment wherein the piston 30 is fixed to the axle 38, it is necessary to provide sealing means to inhibit the flow of liquid out of the holes 40 and 42. This is accomplished by providing suitable sealing rings 44 which also act as braking means. Two hollow knurled knobs 46 are provided at either end of the cylinder 20. These knobs are threadedly engaged into the end pieces 48 and 50 (having the inner surfaces 26 and 28, respectively). Between each sealing ring gasket 44 and each threadedly engaged knurled knob 46 is pro-

vided an annular ring 52. Thus, the knurled knobs may be rotated to force the annular rings 52 toward the sealing gaskets 44, which in turn deflect the sealing gaskets 44 inwardly and exert a greater pressure against the axle 38 to inhibit axial sliding of the axle 38. It is necessary for the knurled knobs 46 to be hollow throughout their entire length so that the axle 38 can pass therethrough as the piston 30 approaches either end wall 26 or 28.

The means 22 for passing the liquid from the barrel 14 to one of the chambers 34 or 36 and to simultaneously remove liquid from the other chamber and pass it to the nozzle 16 comprises a series of pipes or passageways and a four-way three position valve 54. The valve 54 comprises a frustro-conical plug 56 seated in a frustro-conical hole 58. A retention plate 60 is provided at the small end of the plug 56 and is pinned thereto to prevent the plug 56 from escaping the hole 58. Peripherally spaced about the plug 56 and the retention plate 60 are a series of springs 62 which bias the retention plate 60 away from the seat 58 to tightly force the plug 56 into the seat 58. A suitable pipe 64 passes from the barrel 14 to the dispenser 12 where it is connected to a nipple 66. The nipple 66 provides egress means into a first passageway 68 which passes to the valve 54. A second passageway 70 lies between the valve 54 and the chamber 34, the passageway 70 emptying into the chamber 34 through an opening 72 in the wall 26. As with the second passageway 70, a third passageway 74 is provided between the chamber 36 and the valve 54. A fourth passageway 76 is provided from the valve 54 to the nozzle 16.

As can be clearly seen in FIG. 3, the passageways 68, 70, 74 and 76 all enter the valve seat 58 spaced at angles 90° from one another. The plug 56 of the valve 54 therefore has correspondng holes in effect placed at 90° about its circumference to permit passageways adjacent one another to be interconnected; this is provided by the narrow portion 15 of the plug 56 along its length thereof. Thus, in FIG. 3 as shown in solid lines, the plug 56 is in a position to permit no flow. If the plug is moved to the position shown in phantom in FIG. 3, however, the passageways 74 and 76 are interconnected, as are the passageways 68 and 70. If the valve is rotated to a position 90° from the position shown the passageways 68 and 74 will be interconnected, as will the passageways 70 and 76.

The position of the valve plug 56 is preferably controlled manually by a handle 78 which permits the valve plug 56 to be rotated; alternately, the rotation of valve plug 56 may be operated automatically by means such as a coin operating device.

The narrow portion 15 of the valve plug 56 provides larger passageways through the valve 54 to achieve a maximum rate of dispensing as opposed to a lower dispensing rate when holes are placed in the plug at 90° (e.g. FIG. 2 of Patent No. 2,998,164).

FIG. 6 shows another embodiment of the valve 54 utilizing a valve plug 56' having a narrow portion 150 and a thick portion 152 at a point axially along the length of the conical plug 56' corresponding to the passageways 68, 70, 74 and 76. This embodiment is particularly effective to prevent foaming, spillage and waste where the beverage being dispensed is highly carbonated and/or where the temperature of the beverage is apt to rise. FIG. 6A shows the valve in the shut-off position and FIG. 6C shows the valve in one of its normal open positions to permit beverage to simultaneously flow into one chamber and out of the other. This embodiment, however, also provides the additional function illustrated in FIG. 6B where flow is permitted between one of the chambers (here, chamber 36) and the dispenser nozzle 16 but is prevented from the liquid source 14 to the other chamber; this has the function of depressurizng the beverage (located in a measured amount in chamber 36) to



the atmosphere automatically by atmospheric contact from the nozzle 16 through pipe 76 immediately before continued rotation of the valve plug 56' breaks sealing contact with the pipe 68 opening as shown in FIG. 6C.

It is preferable, but not essential, that a suitable air bleed valve 80 be provided along the passageway 68. The air bleed valve 80 is of conventional construction and may be actuated by the knurled knobs 82 and 84 in a manner well known. The air bleed valve effectively bleeds trapped air from the liquid as it passes from the barrel 14 and serves to regulate the pressure of the liquid flowing therefrom.

The dispensing system operates as follows:

The valve plug 56 is moved from the closed position illustrated in FIG. 3 to position in phantom in FIG. 3 (also shown in FIG. 5). This causes the beverage in the barrel 14 to be forced through the pipe 64 into the passageway 68 through the valve plug 56 into the passageway 70 through the hole 72 in the wall 26 and finally into the variable chamber 34. As beverage fills the chamber 34, the piston 30 is forced to the left in FIG. 2, thereby making the chamber 36 smaller and forcing air therefrom through the passageways 74 and 76 and out the nozzle 16. When the piston 30 has reached the wall 28, the valve plug 56 is rotated 90° whereupon beverage is forced from the passageway 68 through the valve 56, into the passageway 74 and into the variable chamber 36. This in turn causes the piston 30 to move the right, thereby forcing beverage out of the chamber 34, through the hole 72, into the passageway 70, through the valve 54, into the passageway 76, and finally through the nozzle 16. When all the beverage has been dispensed from the chamber 34, the valve plug 56 is once again rotated 90° and the beverage will then be dispensed from the other chamber 36. It is of course unerstood that the cylinder 20 is sufficiently large to hold a volume of beverage which is normally greater than will be dispensed at one time and that, therefore, the normal and non-dispensing position of the valve plug 56 will be as shown in FIG. 3

Although the invention shown is embodied in a preferred form, it is intended that the disclosure be illustrative rather than definitive. Thus, the axle 38, while shown in a horizontal position, may be placed in a vertical position. Similarly, the position of the valve 54 is of no significance; it can be placed either above or on the front side of the cylinder 20. Similarly, the device can comprise one valve 54 centrally located equidistant from the extremities of the cylinder, or two similar valves, each located at the extremities of the cylinder can be provided; where two valves are used, they will work in opposite directions.

The device has many advantages over anything previously known. Thus, because of the nature of the device, there is never any air in the system to contaminate the beverage; there is never an interruption in the sequence of operation; and the pressure is always constant in the whole circuit. The speed of operation can be regulated by speeding up or slowing down the action of the valve 54 on the piston 30; similarly, the speed and movement of the piston can also be regulated by the brake means 44 by turning the knurled knobs 46. The brake pressure should preferably be regulated according to the pressure of the carbonization of the beverage being dispensed.

The activation of the piston 30 as above described brings the opposite extremities of the piston toward the cylinder end walls 26 or 28 at the desired speed and in contact with the liquid under pressure coming from the barrel 14 through the four-way valve 54 so that the beverage passes through the dispensing nozzle 16 into a glass or like receptacle under complete control. Because the chambers 34 and 36 are always either receiving or dispensing the beverage (except at start-up) the walls of the piston and cylinder are continuousiy in contact with the liquid so that damaging alternative contact with liquid and air is avoided.

The action of the valve 54 on the single cylinder 20 of the device serves to regulate and maintain the uniform pressure in the flow of liquid, avoiding the formation of foam or froth and avoiding the agitation of the liquid in the barrel. The system allows a constant and uniform quality of beverage to be dispensed.

With my invention providing the ability to automatically depressurize a highly carbonated beverage such as the beer segregated in the chamber before it is dispensed, it is evident that any needed pressure can be safely applied to the surface of the liquid in the barrel or other bulk source of supply (such as the large tanks now being used in certain areas delivered at lower cost from tank trucks used by the brewery), such pressure having to be increased if the temperature of the beer rises, so that the carbon dioxide gas natural to the beer does not escape, thus retaining the beer for public consumption exactly as the brewmaster made it, and for the first time.

It will be obvious to those skilled in the art that various changes may be made without departing from the scope and spirit of the invention and therefore the invention is not to be limited to what is shown in the drawings and described in the specification, but only as indicated in the appended claims.

What is claimed is:

1. In a liquid dispensing system: a control valve cyclically operable; a movable sealing diversion plug therein centrally rotatably secured comprising a narrow width panel fitted wall-to-wall in right-angled orientation to four ports equidistantly located around its periphery; the first being an inlet port to provide passageway from a source of pressurized liquid to be dispensed in continuing segregated pourings in automatically measured volumes; said ports, the second and third, positioned one on each side, acting as liquid transfer passageways with the flow in opposite directions and in alternating sequence, and to dispense through the fourth, the outlet port; said second and third ports always being open, with the swing of said plug narrow width cross-panel from the middle location which serves to seal both the inlet and the outlet ports, restricted equally on both sides and to a combined arc of 90 degrees; one end of the contact face of the plug cross-panel being just sufficiently wide to seal the outlet port opening to a shut-off position, the other end where contact is similarly had with the inlet port being of increased width with axial contact approximating three times that required for an ordinary closure, so that while the first rotation of the plug would open the outlet port, for atmosphere contact to be had with the segregated localized volume of liquid, to depressurize said liquid, its movement would be retarded owing to the inlet port through which the pressurized liquid must flow to motivate projection of the segregated volume of liquid to be dispensed being made purposefully inoperative until the outlet port has been fully opened to provide maximum facilites for unrestricted passage.

2. A liquid dispensing system comprising a bulk source of pressurized liquid, a control valve, two separated expandable and contractible duplicated chambers in contact therewith, a piston, the movement of which is implemented through use of the pressure exerted on and by such liquid being segregated and then cut off from such bulk source of supply, coupling means whereby as one chamber is contracted to dispense said displaced liquid the other is filled with part of the bulk source of supply and at the same pressure, to be repeated in alternating action through the control valve, after the liquid newly segregated has been opened to contact with atmosphere through fully-opened passageways, and means to depressurize said liquid prior to being dispensed in cyclical valve operation in repetitive operation at maximum volume of flow within the valve structure and through a fully-opened outlet for maximum reduction in agitation otherwise inherent, and of particular significance in the dispensing of carbonated beverages and gas-charged liquids, such as beer, where



excessive foaming otherwise tends to restrict delivery into a glass or other receptacle of an accurately measured volume of liquid and at the speed called for during busy business periods, said means including a controllable port in said valve wherein a transitory position of the valve plug momentarily stops movement of the liquid flow.

3. A liquid dispensing system, comprising a five position control valve; a source of pressurized liquid to be dispensed; means to pass the liquid from said source into and through an inlet port and the opening in said valve and out of a port therein to expand and fill a liquid measuring chamber, to close the inlet port to stop further movement in segregation of the liquid, to open the outlet port with the inlet port remaining closed, thereby to depressurize the segregated liquid without movement, to open the inlet port and dispense the liquid under pressure from the filling of the duplicated chamber coordinated with it made a unitary part of the bulk source of supply, then to have the inlet port closed by a counter direction movement of the valve plug, the outlet port opened with the inlet port closed for the liquid segregated to be depressurized, with the direction of the valve movement continued for the liquid to be dispensed, and in repetitive operation, motivated by manual or other means, in continuing pouring of depressurized liquid in measured amounts, the two adjoining passageways through the valve of equal size, internally enlarged to provide means for maximum rate of flow and speed in controlled segregated volume in dispensing.

4. In a liquid dispensing system, the combination including a five position valve, a bulk source of supply of a gas-charged liquid, held under air or gas surface applied pressure, such as is beer in a keg or other bulk container set to be dispensed introduced into an expandable measuring chamber as a unitary part thereof, cut off from such contact, exposed to atmosphere through a fully-opened circuit to depressurize the segregated volume of liquid without movement, then to dispense same automatically with further orientation of the valve plug, with the chamber contracted at the same rate a coordinated duplicated chamber is filled under pressure of liquid from the bulk source of supply, for the same cycle to be repeated coordinated with movement of the control valve plug, the adjoining passageways therein created being alike in internal structure to duplicate volume of flow therethrough for dispensing only to occur when outlets are fully opened to atmosphere.

5. A liquid dispensing system comprising a single cylinder having a piston spanning its diameter and defining a first variable size chamber on one side of said piston and a second variable size chamber on the other side of said piston; a source of pressurized liquid to be dispensed; a dispenser nozzle; and means for passing the liquid from said source to said first chamber to fill said first chamber and then to fill said second chamber to move said piston and force liquid from said first chamber to said dispenser nozzle, said liquid passing means including a four-way five-position rotary valve, a first pipe from said source of liquid to said valve, a second pipe between said valve and said first chamber, a third pipe between said second chamber and said valve, and a fourth pipe from said valve to said dispenser nozzle, said valve comprising a frusto-conical plug seated in a frusto-conical hole, said plug having two passageways therein having openings disposed at 90° about the circumference of said plug wherein said pipes enter said seat hole at locations spaced at 90° to mate with holes in said plug, said plug having extending radially thereacross, a thin wall of width sufficient to block flow through a pair of said openings spaced 180° apart, said thin wall being just wide enough at one edge thereof to seal one opening, said wall being of increased width about three times the width of said one edge at the other edge thereof, said valve preventing all flow at one position thereof, said valve permitting flow

between said first and second pipes and said third and fourth pipes at a second position thereof, said valve permitting flow between said first and third pipes and said second and fourth pipes at a third position thereof, said valve permitting flow only between said second and fourth pipes at a fourth position and only between said third and fourth pipes at a fifth position, the valve chambers being of larger cross-section than the cross-section of said pipes.



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